April 30, 1935. W. PEASLEE ET AL 1,999,778

GRINDING MACHINERY

Filed May 3, 1933 4 Sheets-Sheet 1

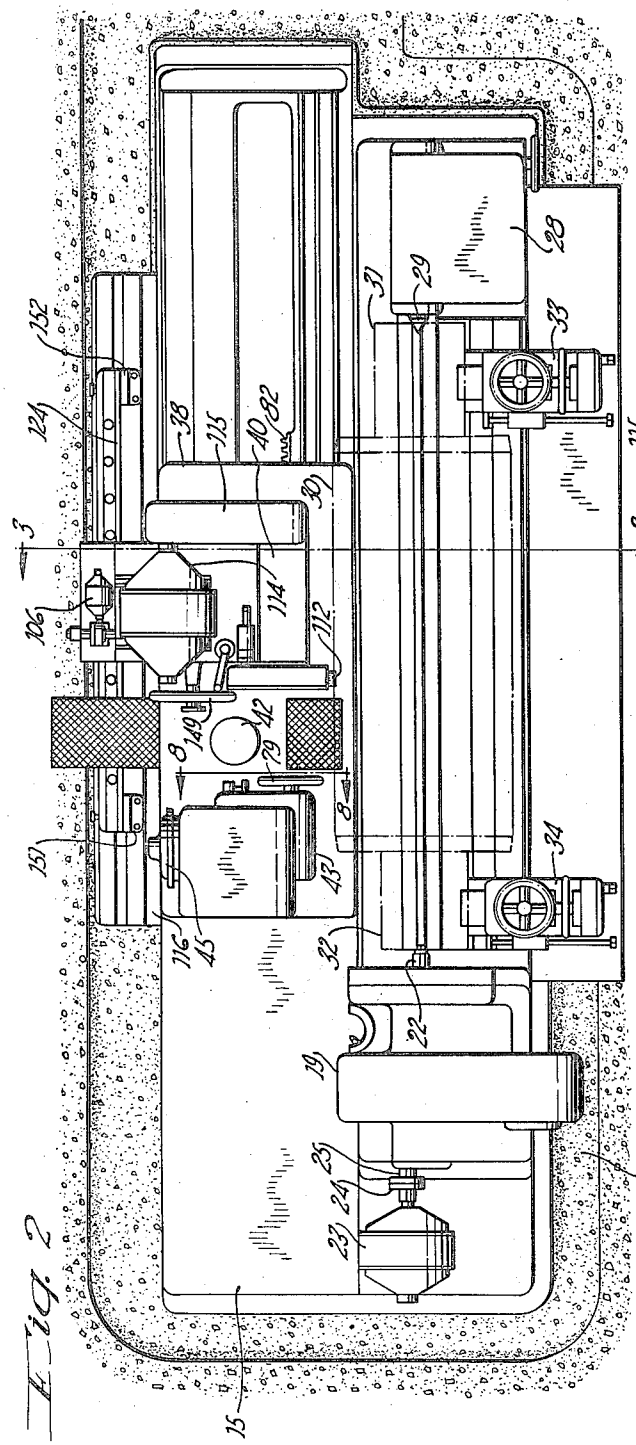


Fig. 2

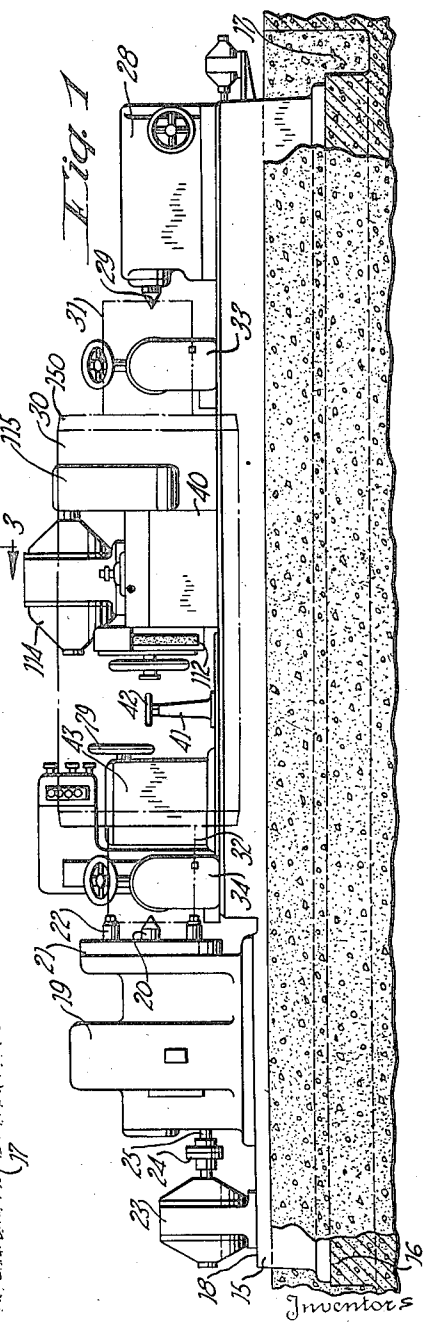


Fig. 1

Inventors

WILLETTS PEASLEE

FREDERICK S. HAAS

By O. K. Parsons

Attorney

April 30, 1935. W. PEASLEE ET AL 1,999,778

GRINDING MACHINERY

Filed May 3, 1933 4 Sheets-Sheet 2

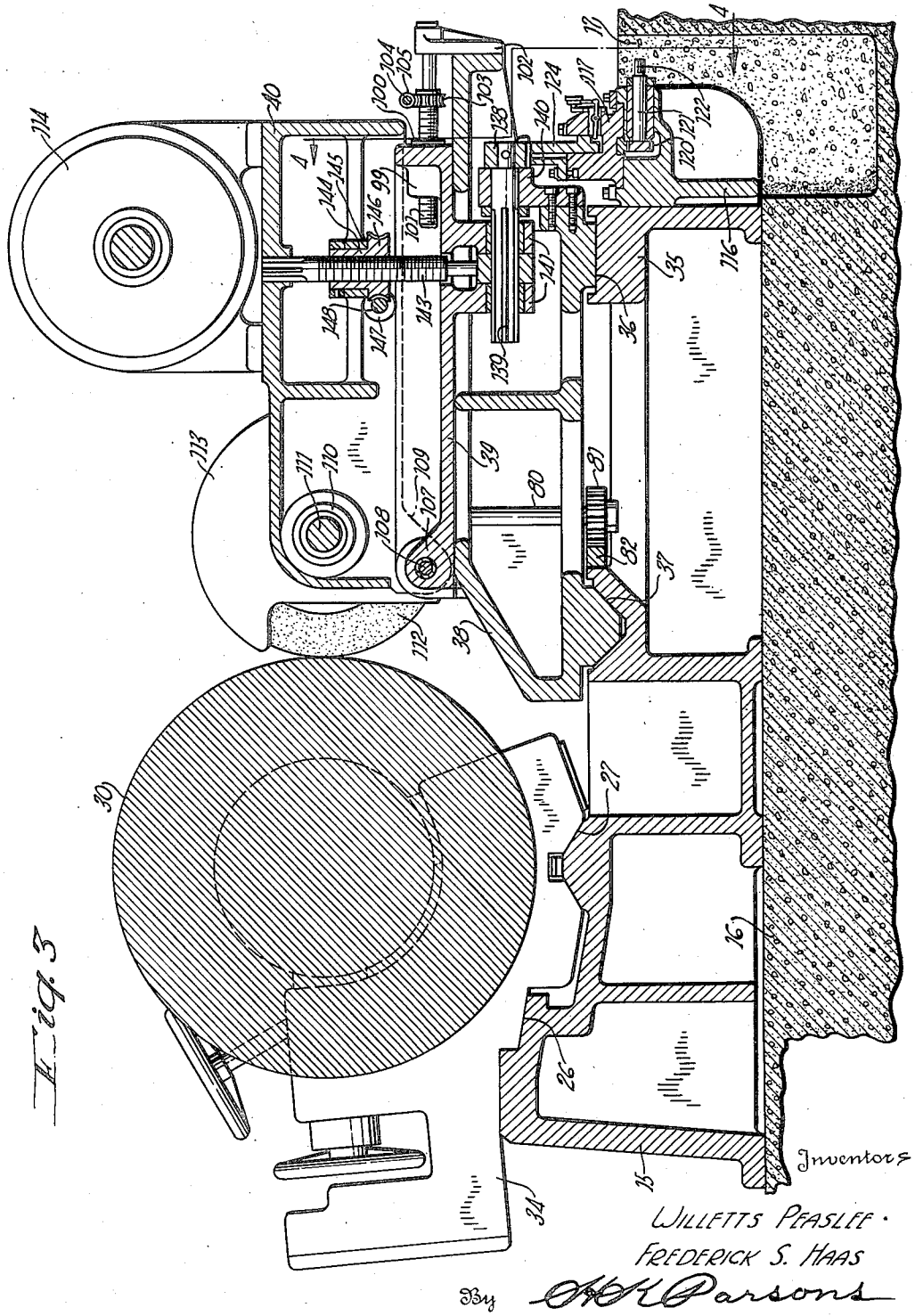


Fig. 3

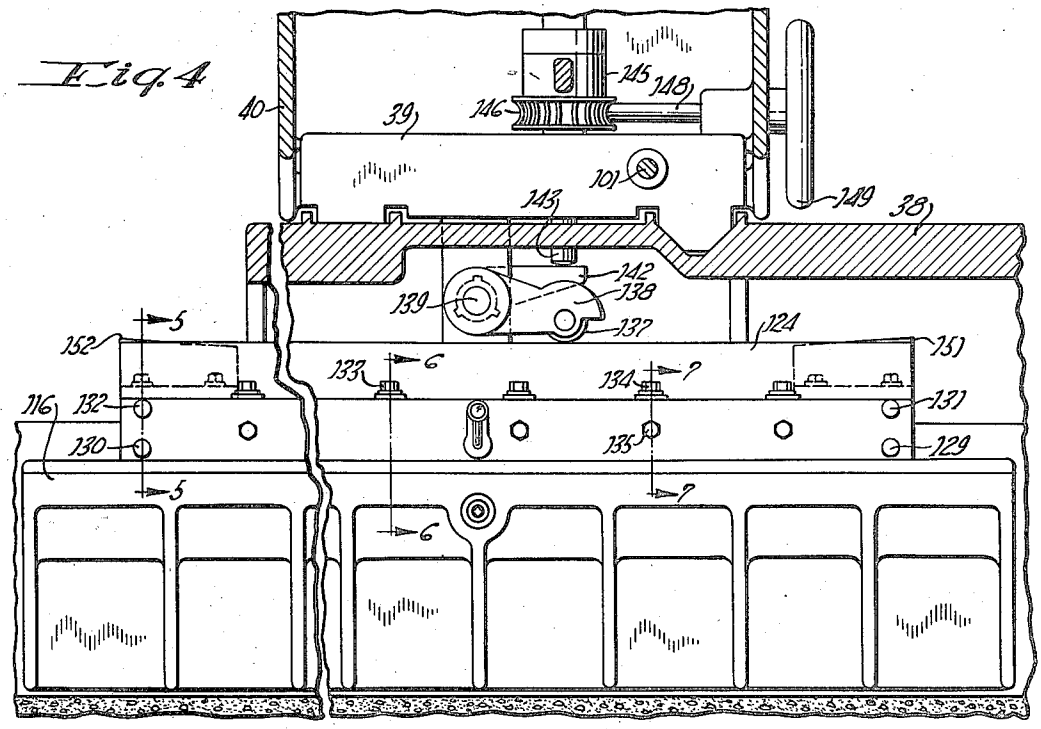
Inventors
WILLETTS PEASLEE.
FREDERICK S. HAAS
By H. K. Parsons
Attorney

April 30, 1935. W. PEASLEE ET AL 1,999,778

GRINDING MACHINERY

Filed May 3, 1933 4 Sheets-Sheet 3

Fig. 4



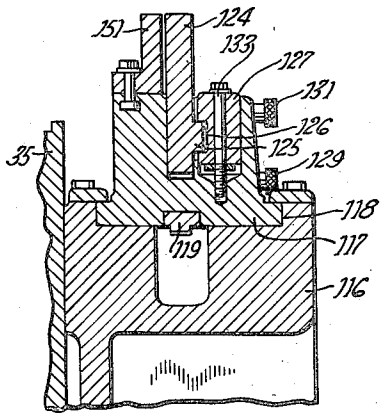


Fig. 6

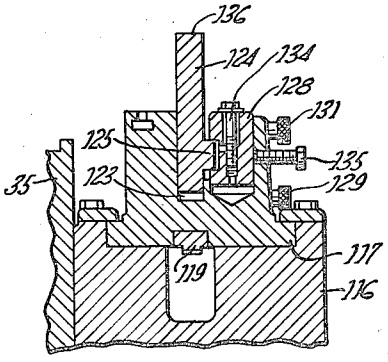


Fig. 7

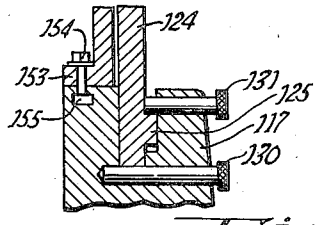


Fig. 5

Inventors

WILLETTS PEASLEE

FREDERICK S. HAAS

By O'K Parsons

Attorney

April 30, 1935. W. PEASLEE ET AL 1,999,778

GRINDING MACHINERY

Filed May 3, 1933 4 Sheets-Sheet 4

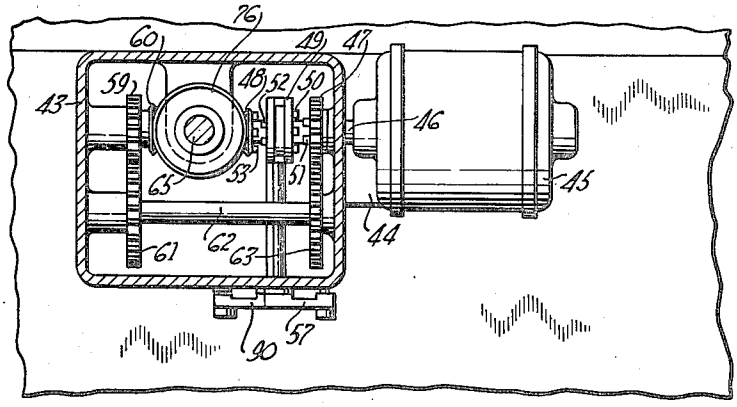


Fig. 10

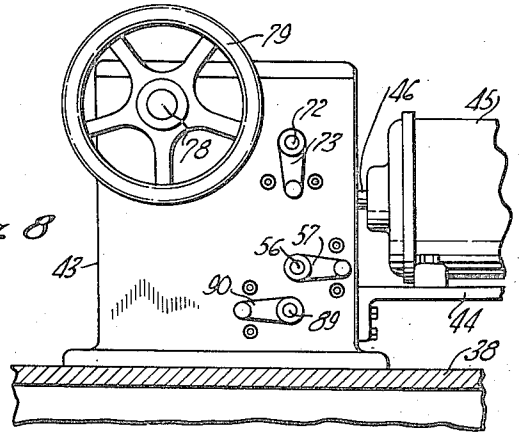


Fig. 8

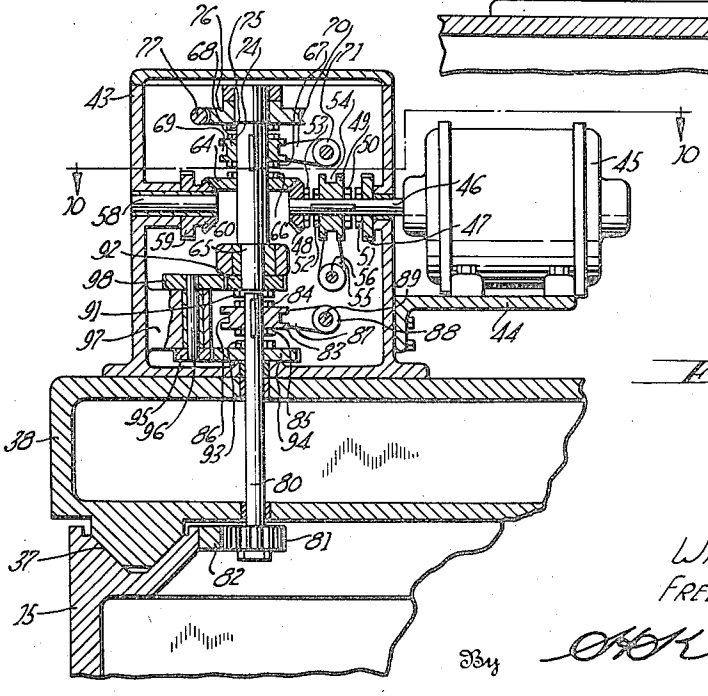


Fig. 9

Inventors

WILLETTS PEASLEE

FREDERICK S. HAAS

By H. K. Parsons

Attorney

Patented Apr. 30, 1935 1,999,778

UNITED STATES PATENT OFFICE

1,999,778

GRINDING MACHINERY

Willetts Peaslee and Frederick S. Haas, Cincinnati, Ohio, assignors to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application May 3, 1933, Serial No. 669,213

9 Claims. (Cl. 51—49)

This invention relates to improvements in grinding machines and particularly to improvements in machines for finishing or grinding rolls to definite forms or contours.

An object of this invention is the provision of a roll grinding machine embodying improved mechanism for effecting the formation of large rolls and particularly for forming the ends thereof.

Another object of the invention is the provision of a cambering mechanism for use with roll grinding machines for effecting and controlling the contour thereof, together with supplementary cambering devices.

A further object of this invention is the provision of a mechanism as above referred to, in which supplementary or additional cambers or other forms may be provided on large rolls which are employed in steel mills, paper mills and the like.

A still further object of this invention is the provision of an improved cambering mechanism whereby various contours or cambers may be provided on work pieces without the necessity of reconstructing the mechanism or providing different expensive essential parts thereof.

It is also an object of this invention to provide a cambering mechanism for use with roll grinders and the like that includes a sectional cam or camber bar, the sections of which are capable of relative adjustment for thereby obtaining various contours on different work pieces.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification taken in conjunction with accompanying drawings, forming a part thereof, and it is to be understood that any modifications may be made in the exact structural details there shown and described within the scope of the appended claims without departing from or exceeding the spirit of the invention.

In the drawings:

Figure 1 is a front elevation of a grinding machine embodying the improvements of this invention.

Figure 2 is a top plan view of the machine shown in Figure 1.

Figure 3 is a transverse sectional view taken on line 3—3 of Figure 1.

Figure 4 is a fragmentary rear elevational view of a portion of the cambering mechanism as seen from line 4—4 on Figure 3.

Figure 5 is a fragmentary sectional view taken on line 5—5 of Figure 4.

Figure 6 is a fragmentary sectional view taken on line 6—6 of Figure 4.

Figure 7 is a fragmentary sectional view taken on line 7—7 of Figure 4.

Figure 8 is an elevational view of the wheel traverse operating and control mechanism as seen particularly from line 8—8 on Figure 1.

Figure 9 is a transverse sectional view taken in a plane behind that of Figure 8.

Figure 10 is a view, partly in section and partly in elevation, as seen from line 10—10 on Figure 9.

Throughout the several views of the drawings similar reference characters are employed to note the same or similar parts.

The machine of this invention is particularly adapted for operation on large mill rolls, such as are used in steel or paper rolling mills. These rolls are either provided with a concave or convex surface, extending from end to end, or they may be cylindrical throughout their length. In addition certain of the rolls are or may be provided with a camber or bevel or any other desired configuration at or near the ends thereof. In the past it has been customary to either retrue or shape the grinding wheel to effect this configuration on the ends of the rolls or else to place said rolls in a subsequent machine to effect this operation. By this invention the said formation of the body portion of the roll, as well as the chamfering or the cambering of the ends thereof, is provided in one continuous operation and by the same grinding wheel.

The machine of this invention comprises, in general, a bed which supports the usual work supporting and rotating mechanism, a grinding wheel for movement toward the work to effect a stock removal therefrom and its controlling mechanism, and means for effecting a relative traverse between the work and the wheel, together with the cambering mechanism for controlling the formation or ultimate contour of the work.

The machine specifically illustrated in the drawings comprises a bed 15 mounted on a concrete foundation 16, here shown as what might be termed an island. The foundation 16 is entirely surrounded by a channel 17, containing the coolant to be supplied to the work and wheel during the grinding operation as is usual in grinding practice. The channel 17 terminates on one side at the level of the floor and on the other side at the level of the foundation which is disposed below the floor level.

The machine bed 15 is provided on one end with a supporting surface 18 on which is dis-

posed the work driver or headstock 19. The headstock 19 has projecting therefrom the center 20, which is surrounded by a face plate 25, carrying the driving dogs 22. Any suitable or desirable means may be employed for rotating the face plate 21 and dogs 22, but as here shown this mechanism comprises an electric motor or prime mover 23 coupled through the coupling 24 with a driving shaft 25 associated with the headstock 19.

The bed 15 from the supporting surface 18 to its other end is provided with guideways 26 and 27, the former being a flat way, while the latter is of the inverted V type. Mounted on the guide ways 26 and 27 for movement there along is a tailstock 28 from which projects the center 29 in axial alignment with the headstock center 20, and together roughly positioning the work on the bed. The work 30 is shown in Figures 1 and 2 in phantom lines, from opposite ends of which project journal bearings 31 and 32. These bearings are respectively supported by journal rests 33 and 34, which determine the axis about which the roll is to be rotated as is the usual practice with machines of this type.

The bed 15 is provided with a rearward extension on which is formed throughout its length a pair of flat and V guideways 36 and 37. Mounted on the guideways 36 and 37 for movement there along is a bed plate 38, which supports a slide 39 for the grinding wheel carriage 40. The bed plate 38 in addition supports the mechanism for effecting the translation thereof, as well as providing the operator's station. For this purpose the bed plate has extending upwardly therefrom a pedestal 41 for the operator's seat 42. Within reach of the operator's seat 42 is the mechanism, as will later be described, for controlling all of the movements of the several units of the machine.

The mechanism for traversing the bed plate 38 and parts carried thereby is best illustrated in Figures 8, 9, and 10, and as there shown, comprises a housing 43 to which is exteriorly secured a shelf 44 supporting an electric motor or prime mover 45. The shaft 46 of the motor 45 projects interiorly of the housing 43 and is rotatively journaled in bearings provided thereby. Loosely mounted on the shaft 46 is a spur gear 47 and bevel gear 48. Splined to the shaft between these gears in a clutch member 49, having provided on one face clutch tooth 50 for engagement with complementary clutch teeth 51 on the adjacent face of the spur gear 47. The clutch member 49 is provided on its other side with clutch teeth 52 adapted to engage with complementary clutch teeth 53 on the adjacent face of the bevel gear 48. From this it will be seen that depending upon the position of the clutch member 49, either the spur or bevel gear will be connected with the shaft. In order to effect the adjustment or shifting of the clutch member it is provided with a circumferential groove 54, receiving the forked end of a shifter lever 55 keyed or otherwse secured to a shaft 56 that projects beyond one face of the housing 43. Secured to the said projecting end of the shaft 56 is a manually actuable lever 57 whereby movement thereof effects oscillation of the shaft 56 and shifter fork 55.

In axial alignment with and rotatively supported by the other wall of the housing 43 is a shaft 58, having loosely mounted thereon a spur and bevel gear 59 and 60. These gears may be independent gears keyed to one another for simultaneous rotation or may be integral as illustrated in Figure 9. The spur gear 59, see Figure 10, meshes with a gear 61 keyed or otherwise secured to a shaft 62, rotatively journaled in the walls of housing 43. This shaft 62 has keyed to its other end a second gear 63 which meshes with the spur gear 47, loosely journaled on the motor shaft 46. From this it will be seen that depending upon the position of the clutch member 49 either the bevel gear 48 will be driven direct or the bevel gear 60 will be rotated through the transmission line, including the gears 47, 63, 61 and 59.

This mechanism constitutes a reversing mechanism since the gear 48 will be driven in the opposite direction from that of the gear 60. The bevel gears 48 and 60 are at all times in mesh with a large bevel gear 64, loosely journaled on a driving shaft 65. In order to be clutched or keyed to this shaft the bevel gear 64 is provided with clutch teeth 66 adapted to be engaged by clutch teeth 67 on one side of clutch member 68. The clutch member 68 is provided with a circumferential groove 69, receiving the forked end 70 of a clutch shifter lever 71, keyed or otherwise secured to a shaft 72 journaled in the housing 43 and projecting beyond the face thereof. The projecting end of the shaft 72 carries a manually actuable lever 73 whereby the clutch is shifted into and out of engagement with the bevel gear 64.

The above described mechanism constitutes a power reversing drive for the drive shaft 65 and in order to effect the manual rotation of the shaft, such as for set-up purposes and the like, the following mechanism is resorted to. The clutch member 68 is provided on its other side with clutch teeth 74 adapted to engage with clutch teeth 75 formed on the adjacent face of a worm wheel 76 loosely journaled on the shaft 65. Meshing with the worm wheel 76 is a worm 77 integral with or secured to a worm shaft 78, journaled in the walls of the housing 43 and projecting beyond the forward face thereof. Keyed or otherwise secured to this extending portion of the worm shaft 78 is a hand wheel 79 whereby the said shaft and consequently the worm are manually rotated. From this will be seen that the shaft 65 may be manually actuated in reverse directions.

In axial alignment with the drive shaft 65 and journaled in the bed plate 38 is a driven shaft 80, carrying on its lower end a rack pinion or gear 81 meshing with the teeth of rack bar 82 secured to the bed extension 35 shown in Figure 5 as secured to the inner longitudinal edge of the V guide way 37 formed thereon. It is the shaft 80 that is power driven through the above described power drive reversing mechanism and the manual drive operable on the driving shaft 65. This shaft therefore is adapted to be connected with the drive shaft 65 for effecting the rotation of the shaft 80. As illustrated in the drawings the shafts 65 and 80 may be directly coupled for driving the driven shaft at a high speed or indirectly coupled for driving the said shaft at a low speed.

This mechanism comprises a clutch member 83 splined on the shaft 80 and being provided on opposite sides thereof with clutch teeth 84 and 85. The clutch 83 is provided with a circumferential groove 86 receiving the forked end 87 of clutch shifter lever 88, keyed or otherwise secured to a shaft 89 journaled in and projecting beyond the housing 43. To the projecting end of the shaft 89 is secured a lever 90 whereby the

said shaft is oscillated for correspondingly oscillating the clutch lever 88 and shifting the clutch member 83.

For effecting a direct coupling between the driving shaft 65 and the driven shaft 80 the clutch teeth 84 are adapted to engage complementary clutch teeth 91 formed on a gear 92 keyed or otherwise secured to the lower end of the driving shaft 65. In order to indirectly couple the said shafts the clutch teeth 85 are adapted to engage with complementary clutch teeth 93 formed on a large gear 94 keyed near the upper end of the driven shaft 80. Meshing with the gear 94 is a pinion 95 keyed to the lower end of an intermediate shaft 96 rotatively journaled in a boss or lug 97 projecting inwardly from one wall of the housing 43. The shaft 96 extends entirely through the said boss or lug 97 and has keyed to its upper end a second gear 98 which meshes with the gear 92 on the driving shaft 65. From this it will be seen that the shaft 80 is rotated at one speed, by being directly coupled with the driving shaft 65, and at a different speed, through that gear train, including the gears 98, 95 and 94, and that the bed plate 38 and parts carried thereby are correspondingly traversed relative to the guiding ways on the bed extension 35.

As was above noted, the bed plate 38 has mounted thereon a slide 39 which supports the grinding wheel carriage 40. The slide 39 is adapted to be actuated relative to the bed plate 38 toward and from the work for which purpose it is provided with a lug 99 in which is secured a nut 100, having threads adapted to mesh with the threads of a cross feed screw 101. The screw 101 is mounted for rotation but held against axial movement in a bracket 102 secured to the rear end of the bed plate 38. In order to rotate the screw 101 it has keyed or otherwise secured to it a worm wheel 103 having meshed therewith a worm 104 on the end of a worm shaft 105. The worm shaft 105 is connected in any desirable manner with the motor shaft of an electric motor or prime mover 106, see Figure 2, mounted on the bed plate 38 to one side of the slide. From this it will be seen that the grinding wheel carriage, together with the slide and parts carried thereby, may be adjusted toward and from the work.

The slide 39 is provided at its forward end with trunnion bearings 107 in which is rotatively mounted a trunnion shaft 108 which is carried by a depending lug 109 carried by the grinding wheel carriage 40 and whereby the said carriage is oscillatably mounted for movement toward and from the work. The carriage 40 provides suitable bearings 110 in which is journaled a spindle 111 having secured to its one end a grinding wheel 112. The grinding wheel 112 is partially enclosed by a hood or guard 113 for confining the coolant usual with grinding machines. Mounted on the upper surface of the carriage 40 is an electric motor or prime mover 114 connected by a suitable transmission enclosed within the guard 115, see Figure 2, with the grinding wheel spindle 111 whereby the said spindle and grinding wheel are rotated at the usual high or grinding rate of speed.

In order to effect the oscillation of the slide 39, carriage 40 and grinding wheel 112 toward and from the work the bed extension 35 has secured to its rear surface a camber mechanism comprising a supplementary bed or support 116. The cambering mechanism is best illustrated in Figures 4 to 7 inclusive, and as there shown, comprises a cambering bar carriage 117 mounted in a guide way 118 formed in the upper surface of the support 116. The carriage 117 is adapted to be manually axially adjusted relative to the support 116 for which purpose it carries on its under surface substantially throughout its length a rack bar 119, having its teeth meshing with a rack pinion 120, see Figure 3, keyed or otherwise secured to a shaft 121 journaled in the support 116. The shaft 121 has its outer end 122 formed to receive a suitable wrench whereby it is manually rotated for effecting the adjustment of the carriage.

The carriage 117 on its upper surface and throughout its length is provided with a groove or slot 123 in which is disposed a flexible cam or cambering bar 124 adapted to be sprung or bent to the desired contour which is to be reproduced on the surface of the work. To effect this springing of the bar it has projecting from one face thereof a lug 125 received in correspondingly shaped grooves 126 formed in bending members 127 and clamp members 128. The bar 124 rests at opposite ends on pins 129 and 130 and has contacting on the upper surface of the lug 126 other pins 131 and 132. It is about the pins 129 and 130 that the bar is sprung in a downward direction while the pins 131 and 132 are resorted to for determining the points about which the springing of the bar takes place in an upward direction. For effecting said springing of the bar bending members 127 are utilized, for which purpose they have passed through them screws 133 threaded at their lower ends into the carriage 117. By reference to the drawings it will be seen that if the screws 133 are actuated downwardly the members 127 will be correspondingly adjusted and through the grooves 126 and lug 125 will correspondingly shift or bend the bar at various points intermediate the pins 129 and 130. Also it will be noted that if the screws 133 are actuated upwardly the bar will be similarly shifted or bent at points intermediate the pins 131 and 132. After the bar is adjusted to the desired position the clamp members 128 are screwed home, utilizing the pinch screws 134 carried by the clamp members 128 and the clamp screws 135 carried by the carriage 117 and engaging the said clamp members 128.

Riding on the upper surface 136 of the bar 124 is a roller 137 rotatively carried by an arm 138 keyed or otherwise secured to the outer end of a spline shaft 139 rotatively journaled in a bearing 140 secured to the rear end of the bed plate 38. The spline shaft 139 is journaled for oscillation in lugs 141, depending from the slide 39, and has splined thereto to partake of the oscillatory movement of the shaft a finger 142. The outer end of the finger 142 contacts with the lower end of a screw member 143 associated with the carriage 40. The screw member 143 constitutes the coupling between the carriage 40 and the mechanism operable by the cambering bar 124 whereby the carriage 40 is oscillated in accordance with the contour of the bar 124.

In order to take up for inevitable wear on the grinding wheel 112 and to compensate for the removal of material from the wheel, as by trueing, the carriage 40 is adapted to be independently adjusted about the trunnion 108. For this purpose the screw 143 is threaded into a nut 144 rotatively journaled in a lug 145 forming a part of the carriage 40. The nut 144 has secured to it or formed integral therewith a worm wheel 146 in mesh with a worm 147 on a worm shaft 148. The worm shaft 148 projects beyond the wall of

the carriage 40 to receive a hand wheel 149 whereby the said worm is rotated.

From the foregoing it will be noted that the carriage 40 and grinding wheel 112 carried thereby are actuated about the axis of the trunnion 108 to feed grinding wheel 112 into the work in accordance with the contour provided on the cam bar 124. It will further be noted that since the cam bar is shaped throughout its length the work or roll being operated upon will be correspondingly shaped from end to end. As shown in Figures 1 and 2, the extreme corners of the work are chamfered or beveled as at 150, and as noted above, in the past it was customary to either shape the wheel to provide this bevel or to remove the roll from the machine and perform this operation in a separate machine.

By this invention this operation is performed simultaneously with the formation of the body portion of the roll. To effect the same the carriage 117 has secured to it additional cam pieces 151 and 152. These pieces or members, as seen in Figure 5, are substantially L shaped, having passed through the shorter leg 153 thereof bolts 154 which have their heads disposed in a T slot 155 formed longitudinally through the carriage 117. It is to be understood that it is not necessary to use both members 151 and 152 if both ends of the work are not to be cut away or contoured. It is also to be understood that if a different or more abrupt contour or of some desired configuration is to be formed in the body portion of the work, that is, intermediate the ends thereof a cam member similar to 151 or 152 may be disposed at the desired point relative to the cam bar 124 for effecting this operation. It will now be clear that by the present invention a roll or other cylindrical part may be provided from end to end with a uniform crown or convexity as is usual practice in mill rolls, and at the same time may have the ends or any intermediate portion thereof further contoured or deformed in accordance with the requirements without removing the roll from the machine and without additional expenditure of time or money for equipment.

What is claimed is:

1. In a grinding machine of the class described the combination with a bed, a work support and wheel support mounted on the bed for relative translation one with respect to the other, and a grinding wheel carriage on the wheel support for oscillation toward and from the work support, of means for effecting the oscillation of said carriage comprising a support secured to the bed, a carriage mounted on the support for adjustment relative thereto to position same with respect to the work, a flexible cambering bar, bending pins on the carriage for supporting the cambering bar, bending means carried by the carriage for bending the bar about the bending pins, means on the carriage for clamping the bar in bended position, and cam members on the carriage for modifying the oscillation of the grinding wheel carriage as effected by the cambering bar.

2. In a grinding machine of the class described the combination of a bed, a work support, a grinding wheel support, said supports being movable axially relative to one another, a grinding wheel carriage, means pivotally connecting the grinding wheel carriage to the grinding wheel support whereby the carriage is oscillatable relative thereto, a second carriage associated with the bed and between which and the grinding wheel support relative axial movement is had, and a plurality of cams on said second carriage effecting an oscillation of the grinding wheel carriage in accordance with the combined contour of the plurality of cams for producing the combined contour of the cams on the work on the work support.

3. In a grinding machine of the class described the combination of a bed, a work support, a grinding wheel support, said supports being movable axially relative to one another, a grinding wheel carriage, means pivotally connecting the grinding wheel carriage to the grinding wheel support whereby the carriage is oscillatable relative thereto, a second carriage associated with the bed and between which and the grinding wheel support relative axial movement is had, a plurality of cams on said second carriage effecting an oscillation of the grinding wheel carriage in accordance with the combined contour of the plurality of cams for producing the combined contour of the cams on the work on the work support, and one of said cams being bendable to vary the contour thereof and consequently the contour of the work.

4. In a grinding machine of the class described the combination of a bed, a work support, a grinding wheel support, said supports being movable axially relative to one another, a grinding wheel carriage, means pivotally connecting the grinding wheel carriage to the grinding wheel support whereby the carriage is oscillatable relative thereto, a second carriage associated with the bed and between which and the grinding wheel support relative axial movement is had, and a plurality of cams on said second carriage effecting an oscillation of the grinding wheel carriage in accordance with the combined contour of the plurality of cams for producing the combined contour of the cams on the work on the work support, one of said cams being adjustable relative to the carriage in the direction of relative movement of the cams and grinding wheel supports to vary the contour of the combined cams and consequently the contour produced on the work.

5. In a grinding machine of the class described the combination of a bed, a work support, a grinding wheel support, said supports being movable axially relative to one another, a grinding wheel carriage, means pivotally connecting the grinding wheel carriage to the grinding wheel support whereby the carriage is oscillatable relative thereto, a second carriage associated with the bed and between which and the grinding wheel support relative axial movement is had, a plurality of cams on said second carriage effecting an oscillation of the grinding wheel carriage in accordance with the combined contour of the plurality of cams for producing the combined contour of the cams on the work on the work support, and means associated with said second carriage and cams for varying the contour of one of said cams and for securing the cams in different positions relative to one another to vary the composite contour of said cams and the ultimate contour produced on the work.

6. In a roll grinder of the class described the combination with a bed, a roll support mounted on said bed, and a grinding wheel support mounted on said bed, of means for effecting a relative axial movement of one of said supports relative to the other, means for pivotally mounting one of said supports for oscillation toward and from the other support to effect a contour on

the work, a cambering mechanism including a bendable bar for effecting the oscillation of the pivoted support to contour the roll throughout its major portion, means associated with the bar for controlling the bend therein for thereby varying the major contour of the roll, a pair of adjustable cam plates associated with the bendable bar for further oscillating the support to provide the chamfers on the roll at the end of the contoured portion, and means for supporting the cambering mechanism and the cam members for adjustment relative to the bed in a direction axially of the roll support for varying the position relative to the roll that the contour is reproduced on the work.

7. A device for providing a contour on mill rolls comprising a support, a carriage on said support, a cam bar on the carriage, means carried by the carriage and cooperating with the cam bar for deforming said bar to the desired contour to be reproduced on the roll, comprising a plurality of adjusting screws spacedly located relative to the length of the bar, bending pins at the ends of the bars supplying pivot points about which the bar is bent, and means for translating the carriage relative to the support.

8. A device for providing a contour on mill rolls comprising a support, a carriage on said support, a cam bar on the carriage, means carried by the carriage and cooperating with the cam bar for deforming said bar to the desired contour to be reproduced on the roll, comprising a plurality of adjusting screws spacedly located relative to the length of the bar, bending pins at the ends of the bars supplying pivot points about which the bar is bent, means for translating the carriage relative to the support, and additional cam members on the carriage for supplementing the contour produced on the roll by the cam bar.

9. A device for providing a contour on mill rolls comprising a support, a carriage on said support, a cam bar on the carriage means carried by the carriage and cooperating with the cam bar for deforming said bar to the desired contour to be reproduced on the roll, comprising a plurality of adjusting screws spacedly located relative to the length of the bar, bending pins at the ends of the bars supplying pivot points about which the bar is bent, means for translating the carriage relative to the support, additional cam members on the carriage for supplementing the contour produced on the roll by the cam bar, and means for adjustably positioning the cam members on the carriage relative to the cam bar.

WILLETTS PEASLEE.
FREDERICK S. HAAS.